

AMENDMENTS TO THE DRAWINGS

Kindly replace the previously filed sheet of drawings including Figure 7 with the attached sheet of replacement drawings including corrected Figure 7.

Attachment: Replacement Sheet

REMARKS/ARGUMENTS

Reconsideration and allowance in view of the foregoing amendment and the following remarks are respectfully requested.

Claims 1-18 are now pending.

Original claim 2 was rejected under 35 USC 112, second paragraph. Claim 2 has been revised above so as to divide the contents of original claim 2 into two independent claims 2 and 13. As such it is believed that the Examiner's rejection has been fully addressed. Reconsideration and withdrawal of the rejection under 35 USC 112, second paragraph, is solicited.

On review it was discovered that a typographical error appeared in original Figure 7. In this regard, the horizontal axis erroneously included the unit "mm" whereas the number of grooves would have no unit. Therefore, Figure 7 has been replaced with a revised Figure 7 that omits the units. Acceptance of replacement Figure 7 is requested.

Original claim 1 was rejected under 35 USC 102(b) as anticipated by Miller. Applicant respectfully traverses this rejection.

Claim 1 has been amended to provide that there is an intermediate portion between the grooved axial end portions, the intermediate portion being free of grooves. It has been specified in this regard that the intermediate portion has a substantially constant outer groove that is free of grooves. Support for the foregoing feature now presented in claim 1 may be found throughout the original disclosure including in particular page 11, lines 32-36; page 12, line 30- page 13, line 7; and Figures 2-4. In a structure having a shaft slidably retained in a guide hole, for example extending between a high pressure chamber and a low pressure chamber, a problem has occurred that there is contact abrasion at the end portions of the shaft due to inclination of the shaft. In the past it has been proposed to prevent this abrasion by forming grooves in

the circumferential direction of the slidable shaft along the length of the shaft. This technique reduces abrasion by forming a uniform pressure distribution in the circumferential direction of the grooves with oil interposed in the grooves (increasing an area supporting the slidable part) and by reducing the inclination of the slidable part and the concentration of the load on a small area. The greater the number of grooves in the circumferential direction, the greater the effect. However, applicants have recognized that a problem arises with the provision of grooves in that there is an increase in leakage past the slidable shaft because the seal length of the slidable part is reduced.

The present invention provides grooves, only at the axial ends of a slidable shaft, to improve lubricity and to reduce abrasion by interposing oil at the portions that come into contact with the guide hole wall surface due to inclination of the slidable shaft. Applicants have recognized that by limiting the portion at which the grooves are formed to the vicinity of the portion (on the shaft member) that comes into contact with the wall surface and by limiting the number of grooves, it is possible to both prevent an increase in the amount of leakage due to formation of grooves while preventing burn-in (abrasion) in the region of contact. Thus, claim 1 as now presented defines a configuration in which grooves, in which oil is interposed, is provided at axial end portions of the shaft whereas an intermediate portion of the shaft between the grooved axial ends is free of grooves. Claims 2 and 13 are directed to the combination of an injector having a nozzle needle, or a piston for pressing a valve body of a control valve wherein the groove distribution recited in claim 1 is applied to the nozzle needle or the piston.

Anticipation under Section 102 of the Patent Act requires that a prior art reference disclose every claim element of the claimed invention. See, e.g., Orthokinetics, Inc. v. Safety Travel Chairs, Inc., 806 F.2d 1565, 1574 (Fed. Cir. 1986). While other references may be used to interpret an allegedly anticipating reference, anticipation must be found in a single reference. See, e.g., Studiengesellschaft Kohle,

G.m.b.H. v. Dart Indus., Inc., 726 F.2d 724, 726-27 (Fed. Cir. 1984). The absence of any element of the claim from the cited reference negates anticipation. See, e.g., Structural Rubber Prods. Co. v. Park Rubber Co., 749 F.2d 707, 715 (Fed. Cir. 1984). Anticipation is not shown even if the differences between the claims and the prior art reference are insubstantial and the missing elements could be supplied by the knowledge of one skilled in the art. See, e.g., Structural Rubber Prods., 749 F.2d at 716-17.

The Miller patent discloses a structure wherein grooves are formed along an entire length of a nozzle needle to reduce abrasion. Thus, Miller clearly does not teach or suggest limiting the grooves to axial end portions and providing an intermediate portion of the shaft member free of grooves. Accordingly, Miller does not anticipate claim 1, or claims 2 or 13, and the Miller structure will apparently have the disadvantage that although inclination of the slidable part may be reduced, there will be an increased leakage along the length of the shaft due to the limited seal surface.

In view of the foregoing, reconsideration and withdrawal of the rejection based on Miller is solicited.

Original claim 2 was rejected under 35 USC 102(b) as being anticipated by Hofmann. Applicant respectfully traverses this rejection.

Hofmann provides grooves for reducing inclination of a slidable part. However, Hofmann fails to teach or suggest the structure recited in applicant's independent claims wherein grooves are provided in axial end portions but an intermediate portion of the shaft member is free of grooves. Thus, Hofmann does not realize the unique advantages of the present invention, and that abrasion and inclination are reduced but leakage along the length of the shaft member is limited. It is therefore respectfully submitted that Hofmann does not anticipate nor render obvious the invention claimed.

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The remaining art of record does not anticipate nor render obvious the claimed invention either.

All objections and rejections having been addressed, it is respectfully submitted that the present application is in condition for allowance and an early Notice to that effect is earnestly solicited.

'Respectfully submitted,

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